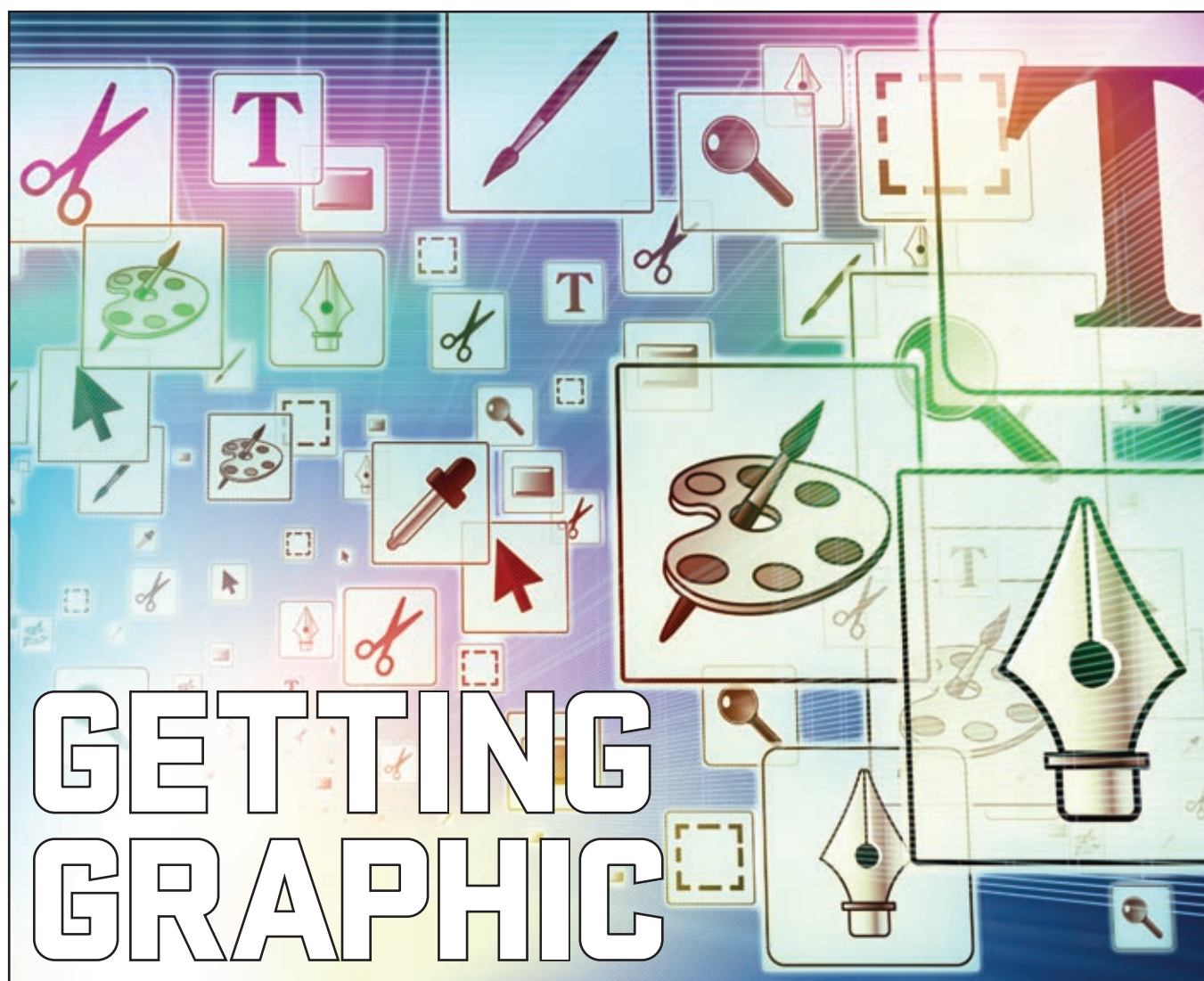




The key to making an instant impression with a document or website is graphics. But few of us have received schooling in the fundamentals of design. Adam Banks brings you up to speed with his comprehensive masterclass

If you have a digital camera, a printer and a PC, there's nothing to stop you getting stuck into graphic design. People with talent, skills and training may be better at it, but there's no reason why you can't have a crack at anything graphic designers can do. This is good news if you don't have the budget for a professional and you have sole responsibility for doing everything for your club or business.

The trouble is knowing where to start, and how to get your head around the unfamiliar technical concepts. In this feature, we provide you with enough tips, technical primers and creative advice to boost your graphic design expertise. We'll cut through the hardware and software specifications to get the right choices. We'll tell you what the manuals won't: how the professionals get results that look 'professional'.

So read on to find out all you need to know about the equipment you might want to use, the software you'll need, and the various printing and typesetting options available.

CHOOSING GRAPHICS SOFTWARE

You don't need expensive software to work like a pro. With a bit of knowledge you can pick up the right tools for under £100, or even for free.

There are two basic varieties of digital graphics: bitmap and vector. Bitmap images are made up of a grid of dots or 'pixels', short for 'picture elements'. A digital photograph is a bitmap; the camera's light-sensing chip itself consists of a grid of millions of cells, each of which records the amount of light falling on it. By measuring red, green and blue wavelengths separately, the colour of each pixel is recorded. In the 'Resolution and colour depth' box on page 137, you can find out more about how colour is stored and how the number of pixels determines the image's resolution.

Bitmap-editing programs let you change the pixels of an image in all kinds of different ways. The commands you're most likely to need for digital photos are tonal adjustments, which apply mathematical operations to the values of all the pixels to alter the appearance of colour, light and shade. It could take you months to experiment with all the adjustments available, but in the 'Tonal correction' box on page 138 we show you how to copy some commonly used professional methods in a few clicks.

The professional bitmap-editor is Adobe Photoshop, but you can get many of the same features in programs costing under £70.

Photoshop Elements (www.adobe.com/products/photoshopelwin) has a lot of its big brother's commands, plus an easier-to-use interface and extra creative features. Another good choice is Corel Paint Shop Pro XI (www.corel.com/paintshop), which concentrates on providing a complete set of Photoshop-style advanced adjustments.

QUICK ON THE DRAW

Vector graphics are very different to bitmaps. Made up of geometric descriptions, they're mainly used to define smooth, hard-edged shapes, as in drawings, diagrams and text characters. We explain more in the 'Working with vector graphics' box on page 134. Drawing and desktop publishing (DTP) programs are based on vector graphics, although they can work with bitmap images, too. You would normally choose drawing software to produce artwork or single-page documents involving more graphics than text, while DTP programs handle more complex text-based documents, from business stationery and brochures through to magazines such as *Computer Shopper*.

CorelDraw Graphics Suite X3 is a comprehensive drawing program with a bitmap



Having words

Typography explained

Typesetting is one of the most skilled areas of graphic design. Here are some of the basic concepts involved.

The story should have a headline, which is big, followed by body text, which is small, between eight- and 11-point, where a point is $\frac{1}{72}$ of an inch. Text is formatted in paragraphs; finish a paragraph by pressing Return. A paragraph is usually ranged left, which means each line of text starts at the left and finishes at the end of the last word that will fit, leaving a ragged right edge. The first paragraph starts flush, while others have the first line indented by about 0.5cm or 1cm.

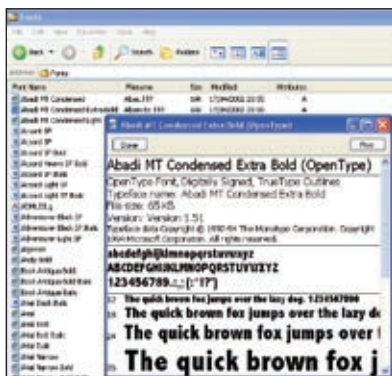
Justified text is automatically spaced to make both margins straight, but making this neat takes skilled setup, and ranged left is more popular these days anyway. Headlines are ranged left, not centred, and have capital letters where normally used, not on every word.

Spacing between lines is called leading, from when type was set with blocks of lead. Make it about one-quarter bigger than the point size. Keep to the same settings throughout. In order to make a story fit, change the text, not the typesetting.

A book has one column of text per page; a magazine or newspaper has two or more. A headline starts above the first column of its story and may span others. Break up a story with a crosshead every few paragraphs. A crosshead is usually a few words about what's coming, in bold, ranged left or centred. Leave a blank line before it and set the following line flush – that is, not indented.

Use one space after punctuation, never two. Turn on smart quotes, so apostrophes and quotation marks come out curly or angled. For a hyphen (in joined-together words) use the hyphen key; for a dash (to separate parts of a sentence) hold Alt and type 0150 on the numeric keypad.

For serious type tips, read Phil Baines' *Type & Typography*, Laurence King 2005, ISBN 9781856694377.



▲ A font is a full set of letters, numbers and symbols in a certain typeface, such as Times New Roman. Serif faces have edges or 'feet' at the ends of letters, while sans-serif faces don't. There are no rules about which to use where, but most publications use one of each, chosen to look good together

editor included. Professionals often prefer Illustrator, available with Photoshop as part of Adobe Creative Studio. However, you can get Xara Xtreme (www.xara.com), a very capable drawing package, for just £40. Alternatively, Serif DrawPlus 4, an old but perfectly usable vector program, is available free when you register at www.freeserifsoftware.com. Adobe InDesign, available with Creative Suite or separately, leads the DTP market, in competition with QuarkXPress. If you don't fancy spending several hundred pounds, though, Serif has a DTP package called PagePlus, which is available in a free version. The latest full edition, with professional features such as PDF creation and preparing for commercial printing, costs a very reasonable £44 including VAT from www.serif.com/pageplus.

UNDERSTANDING DIGITAL CAMERAS

Photographs are involved in almost every kind of graphics project. Whether or not your shots look professional depends as much on your skill as an image-maker as on the capability of your camera. In our 'Digital photo tips' box below, we offer some instant tips for better photographs. However, your first task is to pick a suitable camera.

Digital cameras fall into four groups: professional, semi-pro digital single-lens reflex

(SLR), bridge and consumer. Professional equipment costs a fortune. At the other end of the scale, prices start at under £100 for a decent 5-megapixel camera. You'll find our current recommendations in *What's New: Photography* on page 30. Consider whether you want an ultra-compact point-and-shoot that will slip into a pocket, or a more fully featured camera with extra modes to give you more creative control.

FINE DETAIL

Megapixels means millions of pixels and is shorthand for the detail a camera can capture. A 5-megapixel image will look sharp (assuming it was sharp when you shot it) when printed up to about A4 size. That's as large as most projects will require, but only if you're going to show the whole image. In practice, you'll often want to crop a photograph, using just part of the whole image, which means you're throwing away some of the pixels. If you want more resolution, between £200 and £250 including VAT will buy you a 7- or 8-megapixel camera such as Sony's Cyber-shot DSC-W100, which won a Best Buy award in *What's New: Photography*, *Shopper* November 2006. Ten megapixels is currently the top of the range for affordable cameras.

Photographers will tell you resolution isn't everything, and they're right. Manufacturers often squeeze too many cells into the tiny sensor in a compact camera, resulting in excessive

Shot to pieces Digital photo tips

Modern automatic cameras help you get a usable picture every time, but you can create more professional shots with a bit of extra know-how.

The job of a camera is to focus light on to film or, with a digital camera, a light-sensing chip. Light enters the lens (actually an array of lenses) and travels through a hole, the aperture, which can be widened or narrowed. The light strikes the film only when the shutter is opened briefly. This is triggered when you press the shutter-release button to take a picture. The length of time it stays open – the shutter speed – governs the total amount of light collected, the exposure. The recorded image starts off black and gets progressively lighter while exposed. How fast it lightens depends on the sensitivity or

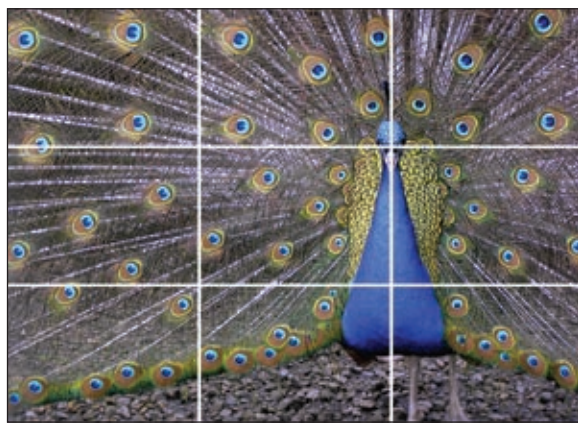
speed of the film, rated from around ISO 150 (slow) to ISO 1,600 and beyond (fast). The sensitivity of a light sensor can be adjusted, but faster generally means a grainier image.

Your camera adjusts focus, aperture, exposure and sensitivity automatically to get a decent picture. However, you can intervene to make it look the way you want. Let's start with the obvious. Focusing means adjusting the lens according to how far away something is. But which something? Autofocus usually goes for whatever is in the middle of the frame. If your subject isn't, it may be out of focus while the background is sharp. To prevent this, first point the camera straight at the subject. Press the shutter button halfway; you should feel this, and a light may come on. Focus is now locked. Holding the

button, move the camera to frame the shot as you want (without changing distance), then press the button fully to take the picture. Even centred subjects can be let down by multipoint autofocus, which looks at the whole scene. Check the instructions for a single-point option.

A half-press usually locks exposure, too. If a landscape comes out dark because the camera is exposing for the bright sky, point at a dark area first. If the sky comes out white, point at a brighter area next time to reduce exposure.

Most digital cameras have a time lag between pressing the button and the picture being



▲ The 'rule of thirds' is a useful trick to help compose shots. Imagine the frame is divided into a 3x3 grid. Frame your shot so one or more key elements lie not in the squares themselves, but at corners of the central square, where the gridlines cross, giving you four points



colour speckling, or 'noise'. This is usually addressed by noise reduction, giving images a smeary effect when examined closely. So while there's no point in buying a camera with fewer megapixels than you need, it's equally pointless to spend money on megapixels that could buy you better image quality. Read the camera reviews in *Shopper* to find the best choices.

Another important feature is zoom. Don't buy a camera unless it has at least 3x optical zoom; you can't always get right next to what you need to shoot. Optical zoom works by moving the lens, as in a traditional camera. Ignore digital zoom, which just blows up the picture, reducing quality. Super zoom cameras, from around £250, offer 10x or 12x optical zoom, ensuring you'll rarely miss a shot because you're too far away. However, you'll need a tripod or a steady hand to shoot at this magnification without blurring the picture. Some super zooms incorporate image stabilisers good enough to rescue most handheld shots. Panasonic's excellent DMC-FZ7, which we reviewed in *What's New: Photography, Shopper* August 2006, is now being replaced by the FZ8, which has 7.2 megapixels and 12x zoom.

TAKE IT TO THE BRIDGE

Moving up the range, Panasonic's £364 Lumix DMC-FZ50, which won a Best Buy award in

What's New: Photography, Shopper January 2007, is the best of the so-called bridge cameras, filling the gap between compacts and Digital SLRs (DSLRs). DSLRs are modelled on traditional 35mm SLR cameras, with a single-lens reflex system that diverts incoming light to the viewfinder until it's time to take the shot. This means existing equipment and techniques can be used, and thanks to larger light sensors image quality is better than with a compact.

A digital camera's sensitivity is quoted as an equivalent of the ISO ratings established for film, and can be adjusted automatically or manually to suit conditions. Beyond ISO 100, suitable for fairly bright sunlight, most compacts start to show significant noise, while DSLRs give decent images to at least ISO 800. However, while a compact camera's LCD screen will show a live, moving preview of exactly what you're going to get when you press the button, DSLRs leave you to set up your shot in the viewfinder, showing only the picture afterwards. Bridge cameras offer a compromise: the DMC-FZ50 provides just about all the manual controls you'd expect from a DSLR, a live preview and a built-in zoom that would be prohibitively expensive in an SLR lens, in return for more compact-like image quality and low-light performance.

Canon's EOS 400D is the best-value DSLR, costing around £500 including VAT with a 3x zoom lens. The Nikon D80 offers the same 10-

megapixel resolution for around £150 more, but has a clearer viewfinder, and many photographers prefer its overall feel. If you can manage with a 6-megapixel camera then Nikon's D40 SLR, reviewed in this month's *What's New: Photography*, costs under £400.

The lenses supplied as standard are known as kit lenses. You can also choose bigger zooms or buy the camera 'body only' and add your own lens, perhaps from a brand such as Sigma or Tamron rather than the camera manufacturer. (Note that the D40 lacks a built-in focus drive, so it won't work with all Nikon-compatible lenses.)

The ability to switch lenses is an important professional feature of DSLRs, but whenever you do so you risk dust entering the body and settling on the image sensor, making subtle blotches on your photos. DSLRs use various systems to shake off dust, but if you switch lenses regularly you may need to get the sensor professionally cleaned from time to time.

UNDERSTANDING SCANNERS

A digital camera will handle most of your imaging tasks, but to get existing pictures or other documents into your PC you'll need a flatbed scanner. This works like a photocopier. The scanning head is mounted under a glass sheet, usually A4 size, on which you place your document. When you close the lid and start the scan, the sensor, accompanied by a bright light,

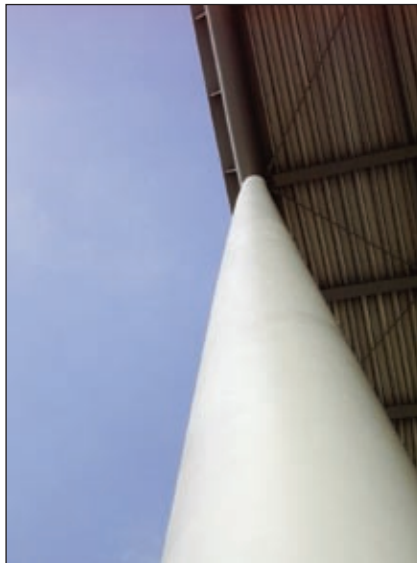


▲ Wide angle plus close-up flash equals portrait disaster. For better results, use natural light, a wide aperture for shallow depth of field, and zoom for more flattering geometry. Shoot from slightly above, not below the face

taken. To reduce this, preset the focus by half-pressing or by selecting a fixed focus option: one metre, three metres or infinity (landscape). Normally, a camera won't focus correctly at much less than a metre. For close-ups, use the Macro mode, which is usually indicated by a picture of a flower. This should focus down to a few centimetres. Wide angle (no zoom) will get closest.

FIELD TRIP

When shooting an object or person, you want it to stand out in focus while everything behind it is blurred. This is known as a small depth of field. Compact cameras give a large depth of field by default, which is good for big scenes but gives a characteristically amateurish look to portrait and detail shots. To reduce it, use a larger aperture, setting a faster shutter speed to keep the exposure correct. Your camera will do this automatically if you select Portrait mode.



▲ The job of commercial photographers is often to make the mundane look exciting. Look for angles that make lines and planes divide the frame and lead the eye across or into the scene

Most cameras have several of these program or scene modes for different purposes. The Sports setting ensures the fastest shutter speed, freezing action. Aperture priority (Av or A) and shutter priority (Tv or S) modes let you fix one setting manually – for example, to control depth of field when you're using a tripod and don't have to worry about camera shake. The camera will balance the other setting to correct the exposure.

Finally, always think about framing your shot. For a portrait, fill the frame with your subject, not by going too close – the wide



▲ It can be hard to get depth of field effects with a consumer camera. Try blurring the foreground rather than the background, shooting through or past very close objects

angle will give an unflattering fishbowl effect – but by using zoom. For a scene or still life, think about the two-dimensional composition. The 'rule of thirds' is handy here (see the screen opposite). Include elements at different distances to give the picture depth. If you're shooting straight, make it truly straight; check the horizon or the verticals of buildings. Alternatively, try wild angles for high-impact shots. Instead of shooting from eye level, hold the camera at waist height, above your head, or on the floor for a worm's eye view.



Throwing shapes Working with vector graphics

Vector shapes are described geometrically. Imagine a piece of graph paper with X and Y axes marked and numbered from 1 to 10. Mark points at, say, (1,5), (3,1), (7,8) and (9,3). Join them up with straight lines and you've made an oblong. If you gave someone else those coordinates, they could reproduce your oblong. It would always come out at the same angle, although it might be bigger or smaller than yours, depending on the size of their graph paper.

That's pretty much how vector graphics work. You can draw lines, circles, polygons,

and more complex shapes defined using bezier curves. You don't have to enter the coordinates, unless you want to; just click and drag to draw shapes where you want. Files are relatively small, because all that's stored is a group of coordinates, and you can view or print your artwork as small or large as you like without any image-quality issues.

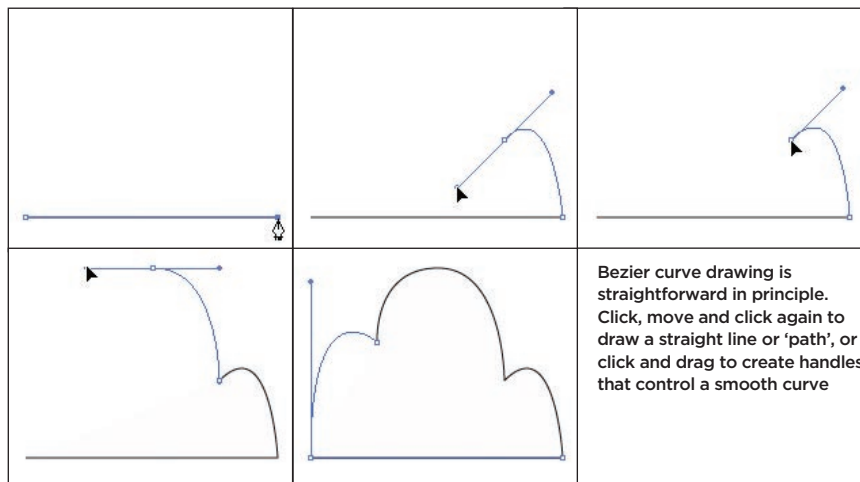
FONT OF KNOWLEDGE

The most common use for vector graphics is one that might not be obvious: displaying and printing text. Fonts on your PC are

stored as vectors, so characters look smooth and crisp whether they are rendered onscreen or printed across a giant poster. When you add text to a photograph in an image-editing program, it's still usually stored as vectors, which can be scaled and edited independently of the image's bitmap content. When you typeset text in a DTP program (or in Word), it's also handled as vectors, as are any lines and boxes on your pages.

If you want to send artwork containing text to another user who may not have the same fonts as you, one way to make sure the text stays the same is to convert it to paths, so the character shapes are recorded rather than a link to the font. DTP programs can now do the same thing in a more elegant fashion by embedding a copy of the font file in the document. This works only within that document, and not with other tasks on the recipient's PC.

When you need to create graphics that may get re-used in various different contexts, such as a corporate logo, the professional approach is to draw them using vectors, so they can be reproduced easily at different sizes. Many bitmap image editors support vector shapes, which are stored on separate layers, like text. Although you still work on an image file with specific pixel dimensions, you can scale it up later and the vector elements will remain smooth. Vector



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Free Consumables Promotions: Offers open to UK residents aged 18 or over only; free Rainbow Kit offer available to purchasers of the Samsung CLP-600N printer only; qualifying models of printer must be purchased new (not second-hand) between 1st January 2007 and 31st March 2007 from a retailer in the UK and originally sourced from Samsung Electronics (UK) Ltd (check with retailer for confirmation); offers only available to end-users; offers not available to purchasers in respect of printers they have purchased at a Samsung supported price (meaning a discounted price which Samsung has made available to the retailer for the purpose of the retailer making a discount



drawing programs take things further, allowing you to build up finely detailed and shaded illustrations. Nowadays they incorporate bitmap effects, allowing things such as soft-edged shadows that would be hard to create using vectors.

Microsoft Expression Design is a unique vector-drawing program that creates fluid, paint-like strokes. Download it as soon as you can, while it's still available as a free beta, and make it your secret weapon for instant graphics that look as if they required enormous skill. Alternatively, try Creature House Expression, the original version, which is available free of charge at www.tinyurl.com/2nqxhc.



▲ Microsoft Expression Design is a creative vector drawing program that's well worth using to create distinctive graphics

passes from one end of the glass to the other, building up an image a strip at a time. Images can be scanned at a very high resolution. Today's flatbeds go up to at least 1,200dpi, which means a full A4 scan would contain 140 megapixels. In practice, the point of high-resolution scanning is to enable smaller original documents to be enlarged, so you could blow up a 6x4in photo to A4 size.

For even smaller originals, you will need even higher resolution. Many flatbeds can scan transparencies, usually with an extra lamp mounted in the lid, or sometimes a separate scanning slot. You can also buy dedicated film scanners for 35mm slides and negatives. Resolutions up to 9,600dpi allow these tiny frames to be blown up to large sizes,

but don't expect miracles; depending on the type of film, the results may be quite grainy. The only way that you can get a really high-quality digital image from 35mm is to have it professionally digitised using a drum scanner, a service available from repro bureaux and print shops.

RESOLUTION NOW

When choosing a scanner, bear in mind that higher resolutions are important only if you actually use them, and ignore any quoted 'interpolated' resolutions, which involve scaling up the captured image (like digital zoom). Scanning resolution is usually given as a pair of figures, such as 1,200x2,400dpi, reflecting the number of points captured across the page



▲ We scanned a 35mm slide using a flatbed scanner with a slide adaptor and a professional drum scanner. While the flatbed scan (left) is smoother with brighter colours, the drum scan (right) has captured far more detail and the colours are more accurate



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General: 08707 telephone line quoted above is standard (non-premium) line operational 9am to 5pm Monday to Friday excluding bank holidays; maximum call charge from a BT landline is 10p per minute; calls from other networks may vary; offers are non-transferable; no cash alternative; offers subject to availability of relevant printers; retailer's t&cs will apply to your printer purchase; full terms & conditions of promotions available at www.samsung.com/uk/; business; Promoter is Samsung Electronics (UK) Limited, Samsung House, 1000 Hillwood Drive, Chertsey, Surrey KT16 0PS.



and the steps taken by the scanning head. Speed is also important, because some scanners can be slow, especially if they connect to your PC using USB rather than USB HiSpeed. Unfortunately, quoted speeds are often meaningless, so you'll need to read group tests to compare performance. In our recent Labs review of flatbed scanners (*Shopper* November 2006), our Best Buy was Epson's Perfection 3490 Photo, a capable all-round flatbed that costs under £100 including VAT. It scanned a 6x4in image at 600dpi in 33 seconds.

The scanner's software can be used either as a standalone program or from your image editor's File, Import menu. For each scan, it first does a quick pass to create a preview image; you can then draw a rectangle around the document so you're not scanning lots of white background. Work out the resolution you need, depending on what you're going to do with the scan (see the 'Resolution and colour depth' box below), and choose the nearest option. There will be other settings you can tweak – getting the very best results from a scan can be a skilled job – but you

should get acceptable results using the presets and automatic adjustments. Just make sure you correctly identify the type of original you're scanning, such as colour photograph or black-and-white drawing, for example. Click Scan to capture the final image, which can be brought into your image editor or saved straight to disk.

UNDERSTANDING PRINTERS

You can now buy a printer for under £60, such as our Best Buy Canon PIXMA iP4300 (*Labs*, *Shopper* December 2006), that will print

Joining the dots Resolution and colour depth

Resolution is a simple concept that somehow gets everyone confused. That's partly because the term is used loosely. Any bitmap image consists of a grid of dots, or pixels. A 5-megapixel digital photograph might contain 2,560x1,920 pixels, so you can say it has a resolution of 2,560x1,920. Ask an expert what resolution you need to print a good-quality photograph, though, and they'll tell you 300 dots per inch, or 300dpi. How do those figures fit together?

The number of pixels in an image is more properly termed its pixel dimensions. Pixel dimensions are connected to resolution (dpi) by a third factor: physical size. Let's say you print your 2,560x1,920 pixel image at A4 size. That's 297mm high, or 11.7in. You can work out what resolution you'll get; 2,560 divided by 11.7 equals 219 dots per inch. Not quite 300dpi, but adequate.

The more dots you pack in each inch, the smaller, more closely spaced they'll be, and the better your eye will be fooled into seeing a continuous image. At arm's-length reading distance, 300dpi is good enough. Further away, such as on a large poster that's across a room, 100dpi or even less may be fine.

CHECKS AND BALANCES

To check the pixel dimensions of a digital photograph, open it in your image-editing program and go to the Image Size command. (You'll get a similar dialog box when creating a new image from scratch.) This will also show a physical size and a resolution in dpi. Remember, the pixel dimensions are real; the image consists of that number of pixels. The physical size and resolution are just nominal values stored for your convenience. Make sure the Resample option is unticked, then enter the physical size at which you want to print the photo, choosing inches or centimetres from the menu. The resolution updates automatically to show how many dots per inch you'll get at this size.

As long as it comes out larger than 300dpi, you're fine. If it's way over, though, consider downsizing the image. It will take up less memory and print faster, and you can make it look sharper (see the 'How sharpening works' box on page 142). If, however, you get significantly less than 300dpi, you can resize the image upwards, making it bigger. This won't make it look perfect at the required size, but it will get blurry rather than pixelated, which looks better.

To change the pixel dimensions up or down, tick Resample, then enter 300 into the Resolution box (keeping the physical size set to what you want). The software uses interpolation to re-create the image using this number of pixels. Interpolation is where, to re-create an image using a different number of pixels, the software has to average the colour values of neighbouring pixels so it can replace several pixels with one, making the image smaller, or insert new pixels between existing ones, making it larger. There are usually several different methods that you can choose from; Bicubic is normally best. This cannot be reversed later without losing quality, so keep another copy of your original image file.

A pixel's colour is usually defined as amounts of red, green and blue (RGB), the primary colours of light. Each of these is stored as eight bits (binary digits), representing the numbers from 0 to 255. Hence the term 24-bit colour (3x8=24), also known as true colour, because the total of 256x256x256=16.7 million colours is about as many as the human eye can distinguish. When you apply adjustments to an image in software, some



▲ Use the Image Size controls to see which resolution you'll get at a certain size (or vice versa) or, by ticking Resample, to change the pixel dimensions. 'Bicubic' refers to the interpolation method used

colour detail is often lost. Starting with more data helps ensure that what is left is never visibly degraded, so images are sometimes stored with 16 bits per colour channel, giving a total of 48 bits. Only more advanced software can handle this.

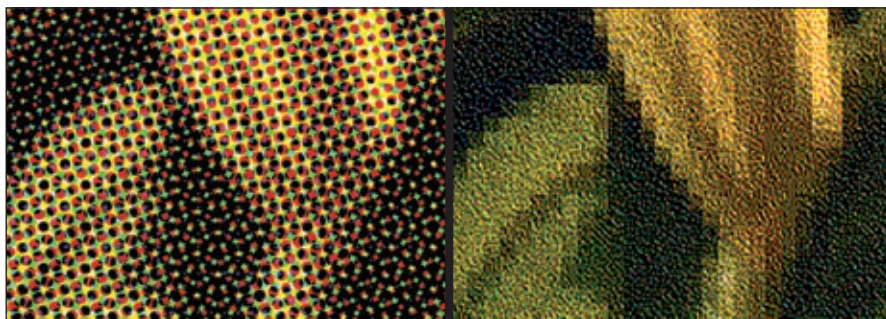
PRIMARY SCHOOL

An alternative colour format is CMYK, based on the primary colours used for printing: cyan (sky blue), magenta (hot pink), yellow and black. Few consumer graphics programs support CMYK, but you don't often need it these days anyway. See the 'Commercial printing' box on page 142 for details.

Finally, individual colours can be specified as Pantone numbers. A commercial printer will look these up in a reference guide and mix the exact ink to match. It's tricky to incorporate Pantone colours into images, but you can use them as 'spot' colours in DTP layouts if you arrange this with your printer. They're also used to specify the solid colours in which vector graphics can be screen-printed on to T-shirts, mugs and so on.



▲ At 300dpi (above, far left), a printed image will look sharp and clear. Using 200dpi (above, left) will give lower quality, but at a glance you might not notice the difference. However, 100dpi (above, right) is too low for documents to be viewed at close quarters, and below this (above, far right) pixels are visible



▲ Commercial presses and most inkjets use CMYK inks. Presses apply a 'halftone screen' to break up images into circles printed in the four process colours, while inkjets use a 'dither', scattering tiny ink dots

fantastic-quality photos up to borderless A4 size in less than five minutes. Unless you're extremely picky about colour accuracy or need more speed, there's little incentive to spend more on a 'professional' printer, although you might want to consider an A3 model. Inkjets use various technologies and work at different resolutions, and some use four inks while others take six. None of these factors is any guide to quality, performance or running costs, so you're better off reading the reviews in *Shopper*.

You may wonder how a printer reproduces all the colours in a photograph when it has only four or six ink colours. It does so by printing different numbers of tiny ink dots within the space of each pixel. That's why printers need massive resolutions such as 2,400dpi. When you

send a '300dpi' image – strictly speaking, 300 pixels per inch (ppi) – to a 2,400dpi inkjet, you're not wasting its resolution. You're using the extra dots to build up exactly the right colour within each pixel. The exception is with graphics that contain hard, sharp lines, such as diagrams and text. Here you'll easily see an increase in sharpness between 300dpi, 600dpi, 1,200dpi and even 2,400dpi. That's why it's best to create and output these types of content as vectors, which means the printer renders them using all the dots it can muster. You can combine bitmap and vector graphics within the same artwork.

Brilliant as they are, inkjets aren't practical for printing lots of copies. There'll be times when you need to call on the services of a commercial printer. Fortunately, many printing companies

also use all-digital systems nowadays, so outputting your work shouldn't be much harder than printing it yourself. You can find out more by reading the 'Commercial printing' box.

UNDERSTANDING COLOUR

Colour reproduction is a highly technical business, but modern hardware and software does its best to take care of it for you. Most digital cameras, scanners, graphics programs and printers support ICC colour management, which means image files include information about how their colour has been encoded.

For accurate reproduction, those red, green and blue values need to refer to something concrete. That reference is provided by a colour space, a mathematical model of the visible spectrum. When you take a picture using your digital camera, its ICC profile is stored along with the image. Your photo-editing software should read this and use it to interpret the colour values correctly. For editing, it should convert the image into a 'working space', either sRGB or Adobe RGB (1998). It's worth reading up on these options in your software manual. Some low-cost image editors don't support colour management, but it's becoming ubiquitous. Adobe Photoshop Elements and Corel Paint Shop Pro both support colour management.

Whether colours look exactly right onscreen still depends on your monitor. LCDs come with profiles (to be installed in Windows when

Balancing act Tonal correction

An image-editing program offers tone and colour adjustments ranging from one-click automatic corrections to more complex tools. Professionals experienced at retouching use all kinds of know-how to give images maximum polish and impact. Here are some basics you can use again and again.

Many traditional corrections are no longer relevant to most photos. That's because digital cameras make them part of the image-capturing process. Unless you're using manual controls when shooting, a standard Auto Levels adjustment rarely alters a digital camera image; it has already been done. More aggressive auto-fixes are more likely to make a visible difference, but they can make photos worse rather than better. If there isn't an obvious problem, don't be afraid to leave well alone.

CORRECTION FLUID

One common problem is incorrect white balance. If the readings from the camera's

light-sensing chip were always translated into colour values the same way, outdoor shots would tend to look bluish, and indoor shots orange or sickly green. In practice, the camera will automatically compensate, but not always correctly. To help spot white balance problems, look at a well-balanced colour picture – maybe a beach scene in a holiday brochure – and then at your photograph. Look for all the colours of the rainbow; are the reds red, the yellows yellow, the blues blue?

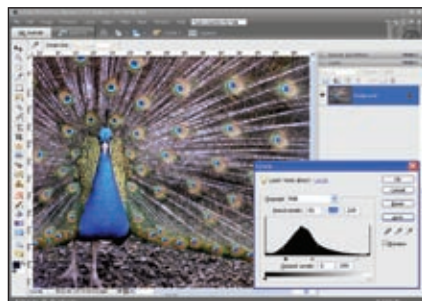
If the colour doesn't seem right, there are various ways to correct the problem. Some programs offer a colour temperature slider; adjust this, and see if it helps. Alternatively, use grey point correction. In Photoshop Elements, for example, press Ctrl-L to open the Levels dialog box. Click on the grey eyedropper on the right. Click on something in the photo that should be grey – that is, neutral in colour. The whole image will update to make it so. Try different spots as necessary until the result looks right.

Sometimes an image is well balanced but looks flat. There are two standard techniques for an instant boost. The first uses Levels. Open the Levels dialog box and drag the black and white sliders inwards from the end of the scale. This increases contrast more effectively than the Contrast command, a crude tool that's best avoided. If the image gets too light or dark overall, drag the grey slider (also known as 'gamma') left or right to correct this.

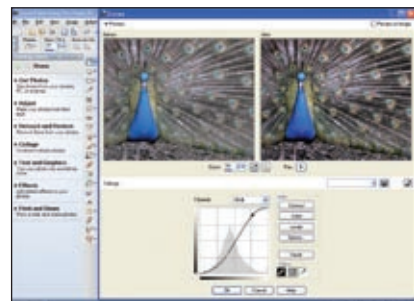
The second technique uses the Curves control, missing from Photoshop Elements but available in other image editors such as Corel Paint Shop Pro. Open this (in Paint Shop, it's under Brightness and Contrast on the Adjust menu), and you'll see a diagonal line representing the graduation from dark to light values within the image. Click on this to add a point, which you can then drag to curve the line. Add two points and bend the curve into an S shape. This makes shadows deeper and highlights brighter.



▲ Use grey point correction to fix images with unsatisfactory white balance



▲ To boost contrast, don't use the Contrast command. Levels works better



▲ Apply an S-curve to add impact to a dull-looking photo



setting up the display) and reproduce colour quite predictably, so with a flat screen you should find everything looks about right. Professionals use hardware calibrators to keep their screens colour-accurate. While this isn't essential, you might consider one of the latest easy-to-use models such as the Pantone Huey, which costs £70 including VAT from www.colorconfidence.com. At print time, most inkjets let you choose between colour-managed output and a choice of auto-corrected or enhanced options, which may tweak colour and contrast for a more impressive-looking picture; it's up to you which to go for.

When it comes to designing documents, you'll need to choose colours for graphics such as lines, boxes, tints, headings and the various other bits and bobs that make up a page. That means getting the hang of which colours go together. For this, you need the colour wheel. A colour wheel shows the primary colours equally spaced around a circle, with secondary colours (those you get by mixing the primaries) in between. If you pick two colours that are opposite each other, they will be complements. Technically, that means if you add them together, you'll get black or white, depending on whether you're mixing paint or light; practically, it means they'll look good next to each other. If you want more than two colours, try a split complementary scheme. Pick your first colour, find the opposite point on the wheel, then ignore that colour and pick two that are equally spaced either side of it.

Colour wheels can be drawn in different ways. You can start with the primaries of light (red, green and blue) or the 'process' primaries used for printing (cyan, magenta and yellow). Previously, the primary colours were thought

Setting the scene Understanding page layout

To design documents, you should use desktop publishing (DTP) software, as we'll assume here, although for just a couple of pages you could use a drawing program, word processor or even an image editor. Set up column guides to serve as a grid to help you keep pages consistent. If you do this on a master page, your grid will appear on each page. The master can also include visible items such as the name of the publication and an automatic page number.

First decide whether your layout has individual pages, such as the front and back of a flyer, or facing pages, as in a book or magazine. To output facing pages, or spreads, you'll need a printer twice the size of your document, for example A3 for A4. Printing the pages so the whole thing will fold together is a complicated job known as imposition, which your software may not handle. A commercial printer would do it for you; see the 'Commercial printing' box on page 142 for details.

Within each page, an asymmetric layout will look best. For example, set guides for five equal columns, but when you add the text boxes on your pages make four of the columns into two columns (each will then span two of the original columns), leaving the third as a narrower sidebar. For facing pages, opt to mirror the pages

so the guides are symmetrical across each spread. Your sidebar column should be on the outside, on the left of left-hand pages and the right of rights.

To design a page, start with your text columns, linking them together so your story flows through. Add headlines and pictures, keeping to the guides but spanning multiple columns. Make sure it's clear what goes together (headline, picture, story), and that there's hierarchy within the page, so some things are big and prominent, while others are smaller and tucked away. Format your text using the tips in our 'Typography explained' box on page 132, and create your paragraph styles.



▲ Two full columns plus a sidebar is a good layout. Run your story in the full columns and put something else in the sidebar. In this example, it's a picture caption. Get more grid ideas from glossy magazines and brochures

Which format? Image file formats

Most applications have a native format for fully editable files, so saving your work and re-opening it allows you to resume working on a document later. These formats aren't usually compatible with other software. For example, some other programs can handle Photoshop's .psd format, but layers may be flattened, text may no longer be editable and files that use special modes such as CMYK (see the 'Resolution and colour depth' box on page 137) may not be read at all.

To enable images to be shared between users, displayed on websites and so on, there are several standard formats. The most popular is JPEG, named after the Joint Photographic Experts Group. Pronounced 'jay-peg', it's often abbreviated to JPG as a three-letter file extension. JPEG uses compression to reduce the amount of data needed to store an image, saving memory and disk space. Colour and brightness are broken down separately so detail can be removed without the picture looking any different to the naked eye. But this lossy compression gets more visible the smaller you make the file, so you're given a choice of quality settings. Don't save an image as a JPEG if you plan to re-edit it later, as it degrades further each time.

Because it makes small files that are quick to download, JPEG is commonly used for

images on webpages. An older format called a GIF is also used on the web, particularly for solid blocks of colour as opposed to photographs. This uses lossless compression to reduce file size without losing any detail, but quality is still limited because the version used supports only 256 colours rather than the millions in conventional true colour (24-bit) images. A GIF file can also store several images, which are displayed in turn as an animation and often used for adverts and other web graphics. PNG is an alternative lossless format that allows true colour but not animation.

To exchange full-quality image files – for example, to bring a photo from an image editor into a layout in a DTP program – the professional format is TIF, which stands for tagged image file. This has a lot of features, including support for CMYK colour and layers,

although support varies between programs. For the widest compatibility, TIFs are often stored uncompressed, making very large files, but many applications also support a form of lossless compression called LZW. This compression option is available in the Save dialog box, or by clicking on a button such as Advanced or Options within the dialog box. JPEG compression is also possible within TIF files, but is less widely supported.

Most consumer digital cameras store JPEG files, with a varying choice of quality levels. DSLRs and certain high-end consumer models use RAW, which gives each camera its own native file format. RAW files must be processed using the software that was supplied with the camera or, alternatively, a compatible utility such as Adobe Camera Raw, which is included with the full version of Photoshop.

Format over substance Common image file formats

Format	GIF	JPG	PNG	TIF	TIF (LZW)
True colour	No	Yes	Yes	Yes	Yes
CMYK possible	No	Yes	No	Yes	Yes
Compression	Yes	Yes	Yes	No	Yes
Lossless option	Yes	No*	Yes	Yes	Yes
Browser support	Yes	Yes	Yes	No	No

*Most software will apply some compression to JPEG files even at the highest quality setting

Fuzzy logic How sharpening works

Sharpening is an important technique in digital imaging. It's an obvious solution if a photograph is slightly soft (out of focus). More importantly, there are technical reasons to apply sharpening. First, printing an image, especially on a commercial press, makes it fuzzier (see the 'Commercial printing' box, below). Second, the smaller you display or print an image, the less sharp it looks. Sharpening can compensate for these effects.

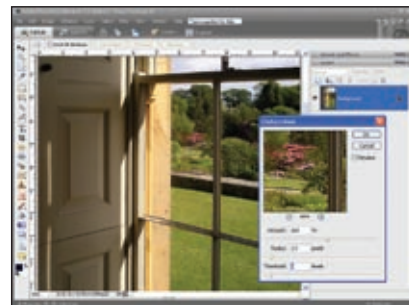
Sharpening works by increasing the contrast between neighbouring pixels, making edges more distinct. Ignore the basic Sharpen command in your image editor and use the professional version, Unsharp Mask. This sharpens only where there's already a certain level of contrast, crisping up edges without exaggerating unwanted detail such as dust and skin pores. This level is set by the Threshold control. You can also increase the

radius of the mask to handle images that are very soft or have been scaled up.

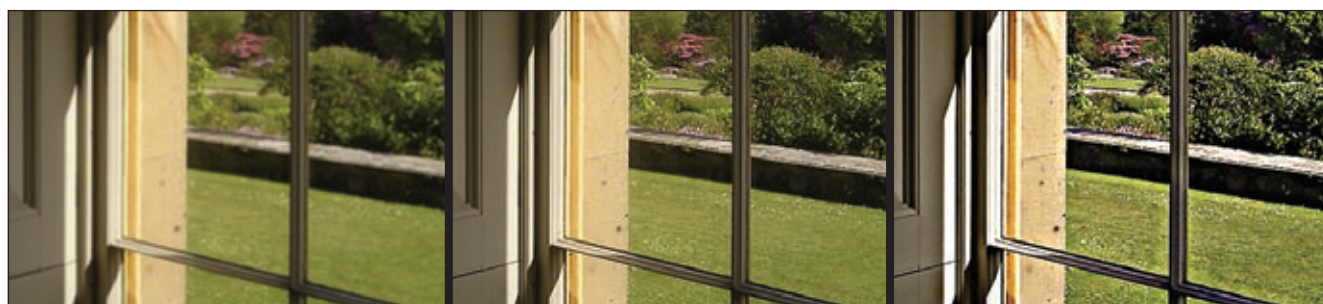
In the Unsharp Mask dialog box, try Radius 1 pixel, Amount 100%, Threshold 4. Zoom the preview to 100% size to judge the results by eye. If there's no visible improvement, increase the Radius. Try 1.5, 2 or maybe 3; you'll rarely need more. If edges are over-sharpened, giving a halo effect, drop the Amount to 70% and if necessary reduce the Radius. If edges look good but other areas become speckled, increase the Threshold.

Combine sharpening with any down-sampling operation; see the 'Resolution and colour depth' box on page 137 for details. Before reducing the pixel dimensions of a large photograph, sharpen it using Unsharp Mask. If it's for printing, use slightly more aggressive settings. When you use Resize, see if the new dimensions for your required physical size are less than half the original.

If so, resample to an intermediate size first, say 70%, sharpen again, then resample to the final size. A big reduction might take several steps. This ensures the final small image still looks sharp.



▲ The Unsharp Mask filter isn't exactly intuitive, but it gives you the controls you need to get the best result from sharpening with each image



▲ Unsharp Mask can bring out the detail in a slightly soft photo (left) and help ensure it looks crisp when it's printed (centre). Don't overdo the sharpening, though, because you'll end up spoiling the image (right)

Do you copy? Commercial printing

Today's colour inkjets give you top-quality colour reproduction on your own desktop. Unfortunately, they're slow, limited in size, and frighteningly expensive to run. When you need hundreds or thousands of copies, poster prints, or bound and finished documents, you'll need to send your work to a commercial printer.

There are two main types of printing press: offset litho and digital. Magazines such as *Shopper* use litho, but it's only cost-effective for around 500 copies or more. Shorter runs are generally digital, with pages output straight on to the press rather than using printing plates. ElectroInk digital presses, such as HP's Indigo, print with pigments suspended in oil, giving a similar inky finish to traditional printing, while toner-based presses, such as Xerox's DocuColor, work more like photocopiers. Both can give excellent quality, but don't use toner-based printing for documents that may be put through a laser printer again, such as company letterhead; the 'ink' will melt off.

In the past, you'd need to convert and save photographs in CMYK format (see the 'Resolution and colour depth' box) before importing them into your DTP layouts. Fortunately, modern DTP software can take care of the conversion at output time.

To supply documents to the printer, you'll need to agree a file format. If your artwork is just an image, a TIFF or high-quality JPEG should be fine. Layouts created in DTP or drawing applications are trickier. Ideally, the printer will work from your software's native files; most handle the professional applications from Adobe and Quark, but it may be harder to accommodate Serif or Corel files, for example. It's increasingly common to submit files as PDFs instead. Most graphics applications can generate these, but it's vital to get your settings right, so make sure you talk to your printer.



▲ Services such as printing.com have made commercial printing more widely available, but having a decent local printer can save lots of hassle

to be red, yellow and blue, and using these gives different pairs of complements. There are various colour wheel programs available, such as Color Wheel Expert 4.2 (\$25, around £13, from www.abitom.com). There are also lots of colour wheels on the web. Try www.ficml.org/jemimap/style/color/wheel.html, or search for colour theory at <http://wikipedia.org>.

HUE KNOWS BEST

RGB (red, green, blue) and CMYK (cyan, magenta, yellow, black) numbers don't mean much when you're picking colours. A better system, supported by most image editors, is Hue, Saturation, Brightness (HSB). It's sometimes called HSV, where V represents Value. HSL, where L means Lightness, is a slightly different model.

'Hue' identifies which colour of the rainbow you're talking about – in other words, where you are in the colour wheel. It's usually given as a number from zero to 359, as in degrees around a circle. To find a complement, just subtract 180. 'Saturation' defines how strong the colour is, usually expressed as a percentage. So zero per cent would be grey, while at 100 per cent the colour is at its purest. Colours often look best together when they have similar saturation. Alternatively, you could try making one colour in your palette stand out by using others at low saturation, which can look sophisticated. 'Brightness' governs how light or dark your colour is. At zero per cent you'll get black, regardless of the hue or saturation. ☐